

Amendments to the Claims

1. (Currently amended) A carrier recovery device of a digital ^{television (TV)} receiver comprising:

an analog/digital (A/D) converter converting an analog signal to a digital signal by using a fixed frequency;

a phase splitter splitting the digital signal to a real signal and a quadrature signal;

a first complex multiplier outputting a real base band signal $i(t)$ and a quadrature base band signal $q(t)$ by performing a complex multiplying of the real and quadrature signals ^a of the split passband ^{of the phase splitter} and a first complex carrier outputted from a first numerically controlled oscillator (NCO);

a second complex multiplier outputting Like Offset Quadrature Amplitude Modulation (QAM) signals $i'(t)$ and $q'(t)$ by performing a complex multiplying of the real and quadrature base band signals $i(t)$ and $q(t)$ and a second complex carrier outputted from a second NCO;

first and second squarers receiving the Like Offset QAM signals $i'(t)$ and $q'(t)$, and performing a nonlinear operation;

a subtractor receiving output signals from the first and second squarers, and performing a subtraction operation;

a passband filter extracting components corresponding to a carrier frequency from the signals outputted from the subtractor;

a Gardner phase error detector detecting a phase error ^{of the passband filter} between the filtered signal and a particular multiple of a fixed frequency ~~on basis of the Like Offset QAM signals $i'(t)$ and $q'(t)$;~~ and

^{loop}
a ~~Loop~~ filter low-pass filtering the phase error, and outputting the filtered phase error to the first NCO.

2. (Currently amended) The ^{carrier recovery} device as claimed in claim 1, wherein the first complex carrier is ~~in~~ proportional to the ^{filtered} phase error outputted from the ^{loop} ~~Loop~~ filter.

3. (Original) The ^{carrier recovery} device as claimed in claim 1, wherein the second NCO generates a frequency of the same type as an Offset QAM signal without reception of a control signal from ^{an} the external.

4. (Original) The ^{carrier recovery} device as claimed in claim 1, wherein the Like Offset QAM signal is an output signal of the second complex multiplier ^{wherein} when the fixed frequency is twice a symbol clock frequency.

5. (Original) The ^{carrier recovery} device as claimed in claim 1, wherein a pilot frequency of the Like Offset QAM signal is located in a frequency band corresponding to 1/8 of the fixed frequency.

6. (Canceled)

6 7. (Currently amended) The ^{carrier recovery} device as claimed in claim 6, wherein the first and second squarers respectively output a carrier signal component having a converted frequency corresponding to 1/4 of the fixed frequency, and a frequency of a signal in the periphery of the ^{second} carrier.

7 8. (Currently amended) ~~The device as claimed in claim 1, wherein the phase error detector includes:~~ A carrier recovery device, comprising:

an analog/digital (A/D) converter converting an analog signal to a digital signal by using a fixed frequency;

a phase splitter splitting the digital signal to a real signal and a quadrature signal;

a first complex multiplier outputting a real base band signal $i(t)$ and a quadrature base band signal $q(t)$ by performing a complex multiplying of the real and quadrature signals of the ^{of the phase splitter} split passband and a first complex carrier outputted from a first numerically controlled oscillator (NCO);

a second complex multiplier outputting Like Offset Quadrature Amplitude Modulation (QAM) signals $i'(t)$ and $q'(t)$ by performing a complex multiplying of the real and quadrature base band signals $i(t)$ and $q(t)$ and a second complex carrier outputted from a second NCO;

first and second absolute value calculators receiving the Like Offset QAM signals, $i'(t)$ and $q'(t)$, and calculating absolute values thereof;

a subtractor receiving outputs of the first and second absolute value calculators, and performing a subtraction operation;

a passband filter receiving the signals from the subtractor, and extracting components corresponding to a carrier frequency therefrom; and

a Gardner phase error detector detecting a phase error between the filtered signal ^{of the passband filter} and a particular multiple of ^a the fixed frequency; and

^{loop}
a ~~Loop~~ filter low-pass filtering the phase error, and outputting the filtered phase error to the first NCO.

^{carrier recovery} 7
8 ~~8~~. (Original) The ~~device~~^α as claimed in claim ~~8~~⁷, wherein the first and second absolute value calculators convert ~~the carrier signal component and components in all data blocks in the periphery of the carrier signal component to have the~~^{to have} frequency corresponding to 1/4 of the fixed frequency.

10. (Canceled)

^{carrier recovery} 7
9 ~~11~~. (Currently amended) The ~~device~~^α as claimed in claim ~~408~~⁷, wherein the first complex carrier is in proportional to the phase error outputted from the Loop filter.

^{carrier recovery} 7
10 ~~12~~. (Currently amended) The ~~device~~^α as claimed in claim ~~408~~⁷, wherein the second NCO generates a frequency of the same type as an Offset QAM signal without reception of a control signal from ~~the external~~^{an}.

13. (Canceled)

14. (Canceled)

15. (Canceled)

^{carrier recovery} 7
11 ~~16~~. (New) The ~~device~~^α as claimed in claim ~~8~~⁷, wherein the Like Offset QAM signal is an output signal of the second complex multiplier ~~when~~^{wherein} the fixed frequency is twice a symbol clock frequency.

^{carrier recovery} 7
12 ~~17~~. (New) The ~~device~~^α as claimed in claim ~~8~~⁷, wherein a pilot frequency of the Like Offset QAM signal is located in a frequency band corresponding to 1/8 of the fixed frequency.